Use of Graphic Organizer (GO) and Comparison of Morpheme Recitation Timings by a University Student with Characteristics of Dyslexia

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Abstract

According to recent studies by the International Dyslexia Association (IDA), as many as one in five individuals has dyslexia (2012). Characteristics of dyslexia include difficulty with word decoding, spelling, fluency in word recognition, and a deficit in rapid automatic naming (RAN). Fluency building activities are recommended for most struggling readers; 60-second timings are often used as a typical measure to gauge success. Due to the lack of research pertaining to different instructional approaches and timing methods for individuals with dyslexia, The study poses the following research questions (1) if use of a graphic organizer (GO) improves content knowledge among young adults with dyslexia and (2) whether young adults with dyslexia produce a higher morpheme- per-second (mps) recitation rate during the first 30-seconds of a 60-second timing than during the second 30-seconds. Using a single subject A-B research design, I utilized the graphic organizer and explicit instruction when teaching 30 morphemes to a university student; I then compared the results of two timing segments within the 60-second timings. These research questions are important within the field of dyslexia research, as many school districts currently use instructional methods and rely on reading assessments that use 60-second timings as 'benchmark' measures. If individuals with dyslexia perform better during 30- second timings, 60-second timings may cause inaccurate student assessment. Additionally, the type of instruction may be more critical for students with dyslexia. This study contributes to existing dyslexia research and may also help determine best instructional practices and testing measures for students with dyslexia.

Keywords: dyslexia, morphemes, timings, university student

Chapter 1: Literature Review

Historical Views of Dyslexia

Dyslexia as a developmental disability has been researched for decades and has grown in priority within the fields of education, psychology, and linguistics (Maisog et al. 2008). Though its working definition has developed as research has expanded— with much still unknown about the learning disability—available knowledge offers insight into the cognitive, behavioral, and neurological components of the disorder (Lyon et al., 2003). Research from 1994 established the most detailed definition of dyslexia; today's definition (and the implication of its components) functionally explains dyslexia as an anomaly with increasing occurrence among identified children and adults (Lyon et al., 2003).

Before 1994, many scholars viewed dyslexia, its causes, and its symptoms as the result of varying hypotheses; such differing research led to lack of consensus among researchers and the medical community. For example, one researcher purported that irregularities in eye movement were correlative to dyslexia among individuals with poor reading skills (Pavlidis, 1985). Another scholar asserted that there was evidence for two distinguishable types of "language disability" among language disorders: specific (or hereditary) and symptomatic (or the result of neurological injuries before, during, or after birth) language disability. The "specific language disability" category was then divided into over seven subtypes—all of which were assumed to be transmitted hereditarily. Dyslexia (included also with "dysgraphia") was one of these subtypes and was explained as simply the "reading and writing disability" (Arnold, 1960, p. 114). Dyslexia, as defined in this case, was part of a larger pool of research contributing to general learning disabilities. With such general application, dyslexia later became the term encompassing "any reading disorder that [was] not the result of organic defect, low intelligence, emotional disturbance, or

environmental deprivation" (White & Miller, 1983, p. 5). To help expand knowledge of dyslexia, Applebee's research (1971) has been cited as one of the first to warn against grouping all characteristics of reading disorders homogeneously under dyslexia and anticipating the emergence of one trait to display the disorder (White & Miller, 1983). In subsequent research, several researchers subcategorized dyslexia into componential parts to better describe the specific deficits individuals experienced (e.g., Boder, 1971; Dochring & Itoshko, 1977; Ingram et al., 1970; Mattis et al., 1975). Although these varying subtypes were inconclusive, they addressed the need for categorization among learning disabilities (White & Miller, 1983). From the plethora of subtypes emerged two leading categories within the disorder: language-related difficulty and visual-spatial difficulty (White & Miller, 1983).

A Working Definition

Among varying hypotheses proposed throughout the late 20th century, a more definitive consensus surfacing by 1994 and has benefitted the study of dyslexia. The work of various researchers contributed to the 1994 definition of dyslexia, which closely resembles the current definition. In summary, the 1994 definition classifies dyslexia as "one of several distinct learning disabilities," that is "characterized by difficulties in single-word decoding," attributable to inaccurate phonological processing (Lyon et al., 2003, p. 2). Distinct from "generalized developmental disability or sensory impairment," dyslexia is often exhibited in reading, writing, and spelling difficulty but does not necessarily correlate with "other cognitive and academic abilities." (Lyon et al., 2003, p. 2). By 2003, the definition had been modified to include the neurobiological nature of dyslexia, along with primary consequences and secondary consequences to expand the definition by drawing on existing difficulties in reading comprehension. Primary consequences include the phonological processing of language. Secondary consequences often lead to decreas-

es in vocabulary and contextual knowledge development and can contribute to the lagging phonological improvement in novel learners (Lyon et al., 2003; Maisog et al., 2008).

The implications of a modified definition from 2003 lead to several important points needing further clarification. First, dyslexia is recognized as one of three categories under "reading disability," which falls under "specific learning disability" (SLD). Furthermore, "specific learning disability" is just one of 13 specific categories under a larger "learning disability" (LD) categorization. Since roughly 80 percent of those with an LD are impacted with "reading disability" under SLD, understanding dyslexia as a phonological problem manifest in reading offers further classification from other reading disorders (e.g., the two others under "reading disability," termed "other" and "environment") (Lyon et al., 2003; Maisog et al., 2008). Similarly, neurobiological aspects of dyslexia should not be overlooked. As a testament to the advancement of science, techniques like the usage of fMRI technology in studying dyslexic patients definitively shows "a failure of left hemisphere posterior brain systems to function properly during reading [among individuals with dyslexia]" (Lyon et al., 2003, p. 4; Maisog et al., 2008). The neurological component of dyslexia offers scientific explanation for the symptomatic causes of dyslexic impairment that historically have been mistaken for visual issues, below-average intelligence, or other misdiagnoses. Neurobiologically, the phonological particularities of dyslexia disallow struggling readers to connect the symbols (i.e., letters) to their sounds or phonologic properties. Additionally, when letters are paired together orthographically, struggling readers have difficulty fragmentizing the letter composition into each letter's basic sound, or phoneme. The disconnect between accurate phonemic processing and recognizing their corresponding letters can, consequently, have negative impact when processing morphemes (or basic units of meaning). Difficulty in morphemic processing leads to a disconnect between words and their meanings. In sum-

mary, phonemic and morphemic deficiencies challenge individuals with dyslexia in the task of accurately connecting letters to sounds and interpreting word meaning (Maisog et al., 2008). Because these two components are critical in reading comprehension, deficits pose inherent and continual difficulties while learning to read (Maisog et al., 2008).

Characteristics of Dyslexia

There are several noteworthy correlations in behaviors and characteristics among those diagnosed with dyslexia. Commonly attributed to dyslexia are deficits in reading, writing, and spelling (Lyon et al., 2003). Additional deficits can manifest in a variety of areas.

Comorbidity. Furthermore, those with dyslexia are often observed having "co-occuring or comorbid deficits in other cognitive and academic areas" (Lyon et al., 2003, p. 2). These areas can include "attention, mathematics, and/or spelling and written expression" (Lyon et al., 2003, p. 3). In recent years, researchers have noticed strong correlation between the symptoms of attention deficit disorders and dyslexia (Rochelle et al., 2009; Wijnants et al., 2012). As with attention disorder, dyslexia is depicted on a continuum that explains behavioral phenomena. Although characteristics of dyslexia are prevalent in reading comprehension and other aspects of literacy, dyslexia co-occurs with other areas of development, such as deficits in both gross and fine motor skills (Rochelle et al., 2009; Wijnants et al., 2012). Similarities between characteristics of dyslexia and of attention disorders have encouraged research of genetic determinants that may predict the presence of both dyslexia and attention deficit disorder among individuals (Rochelle et al., 2009). In addition to the possibility of comorbid occurrences between dyslexia and attention deficits, some research has tested whether speed in individual speech perception affects novice readers and their reading fluency (Snellings et al., 2010). Because low speeds of speech are correlated with phonological deficits, it has been argued that auditory components of language (i.e.,

speech) can be affected by low phonological processing speeds and further affect reading comprehension (Snelling et al., 2010).

Structure-of-Language Deficits. Morpheme deficits can act concurrently with phoneme deficits; combinations of deficits can have adverse effects on reading comprehension (Goodwin & Ahn, 2010). Because English is a morpho-phonological language in which meaning and sound work together to form comprehension and word presentation, morphological awareness is generally thought to correspond with both reading and spelling levels (Goodwin & Ahn, 2010).

Fluency and RAN Deficits. Important characteristics of dyslexia, such as levels of fluency and deficits in rapid automatic naming (RAN), must also be addressed. Reading fluency involves the usage of perceiving phonemes, morphemes, and graphemes accurately with "the perceptual and motor processes necessary to read" (Wijnants et al., 2012, p. 100). Since fluency represents the successful working of processing components and an ability for all components to work together to produce accurate understanding, poor fluency can indicate poor skills in each subset (Wijnants et al., 2012). For these reasons, fluency influences reading comprehension and is commonly related to subsequent performance in writing and spelling (Wijnants et al., 2012). Like fluency, an assessment of phonological processing is constructed using several features. Processing determinants include phonological awareness, or the understanding of and ability to manipulate spoken sounds; memory; and RAN (Thomson et al., 2006). Acceptable levels in all measures indicate ability to phonologically process information accurately. While fluency and RAN disorders are more commonly associated with dyslexia, other characteristics are also measured when testing the effects of dyslexia on reading achievement. These characteristics include comprehension, morphological awareness, vocabulary levels, decoding, and spelling behaviors (Goodwin & Ahn, 2010).

Other Characteristics. Altogether, there are many combinations of factors that affect dyslexia's manifestation in reading comprehension. Connections between the characteristics of developmental dyslexia and applicability to other behaviors are nuanced. Often, an individual may have more than one definitive and succinct learning disability (LD) or specific learning disability (SLD). As with attention or speech disorders, dyslexia and its characteristics can become increasingly convoluted with additional symptoms. This convolution is especially important when considering the misdiagnosis, under-diagnosis, and lack of diagnosis of dyslexia and similarly characterized LDs in the education system and in special education policy.

Effective Instruction

According to IDA (2012), students with dyslexia and its characteristics benefit from "systematic, explicit, instruction in reading, writing, and language" (p. 1). Explicit instruction for students at risk of poor reading comprehension is generally accepted by researchers as effective (Nelson-Walker et al., 2013). Systematic instruction, particularly helpful for students with developmental disabilities, encourages the repetition of student performance objectives (e.g., understanding written content) and structure-of-language instruction that aids literacy advancement (Schnorr, 2011). Because individuals with dyslexia struggle with fluency, word recognition, and reading comprehension, instructional methods that address these deficiencies are recommended (IDA, 2012).

Graphic Organizers. In addition to recommended instructional approaches, research has shown that the use of the graphic organizer (GO) is a helpful instructional tool (Malmgren and Trezek, 2009). When used alongside other supplemental instructional tools, graphic organizers "can be utilized and taught at any age or grade level" (Malmgren and Trezek, 2009, p. 4). While innovative for introducing content, there is little evidence that graphic organizers are inde-

pendently responsible for student improvement in vocabulary or reading comprehension. Rather, it is suggested that graphic organizers be used as an instructional aid with other teaching methods (e.g., monitoring, posing questions, and summarizing information) to improve and expand student comprehension (Malmgren and Trezek, 2009). The graphic organizer instructional method was used in this study; its role will be explained further in the next chapter.

Self-Graphing. Some researchers have begun to advocate for the use of self-graphing in a variety of educational programs (Kasper-Ferguson and Moxley, 2002). Because self-graphing is an effective tool for self-monitoring individual progress over time, student progress can focus on established goals (Kasper-Ferguson and Moxley, 2002). Students can use the self-graphing procedure to visualize their improvement across the data (Fishley et al., 2012). The self-graphing technique was also used in this study.

Diagnosis, Intervention, and Treatment of Dyslexia

Diagnosing dyslexia is increasingly difficult, as aspects of reading comprehension and the individual learner become more nuanced. Alexander and Slinger-Constant note that, "…although all individuals with dyslexia have a similar problem, namely, difficulty reading, they have heterogeneous characteristics, and depending on the child's developmental level, the demands of reading and the required skills are quite different" (2004, p. 745). Generally, the "coding, storage, and retrieval of stable associations between components of spoken and written words are the central processes in learning to read" and are agreed upon as necessary for reading acquisition (Kipp & Mohr, 2008, p. 39). Although the reading process may be more objective, the classification of a "good reader" is riddled with variation (e.g., reading to find the 'gist' of content or reading to develop the ability of synthesizing multiple contents into a comprehensive whole) (Alexander & Slinger-Constant, 2004). From this research, it becomes apparent that di-

agnosis should rest on three central foci. First, a working definition of literacy must be formulated; if a set of specific literacy goals can be determined, then identification and treatment may be more easily standardized. Second, a systematic plan must be in place than can monitor intervention and treatment of identified students. Third, there must be a measure capable and adaptable enough to evaluate student progress during and after the intervention and treatment phases.

In general, four factors affect the relative strength of diagnosis: the age of the student when identified, individual severity, the student's background, and generalized cognitive operations (Meyer, 2000). Various identification methods and treatment processes can help determine future development based on these factors. For example, the age of identification can sometimes predict (given standard trajectory) the length of time in which students will be classified as dyslexic (Meyer, 2000). Deficit severity can impact intervention and treatment output. Relative severity is important, as many students with high severity have been found to experience difficulty in adulthood—particularly in reading (Meyer, 2000). Environmentally, students with reading and processing deficits are sometimes thought to have had finite exposure to educational experiences (i.e. reading with a parent) and activities (Meyer, 2000). Although there is some distinction between students with deficits and students with underdeveloped educational abilities, student behavior can appear similar quantitatively and leads to false causation. For this reason, the background of the individual represents an important variable to consider when measuring the relative success of diagnosis and intervention. The final factor determining diagnostic success is the individual's cognitive operations. These operations can include morphemic and phonological processing, RAN, and their correlative importance at different reading stages (Meyer, 2000). In particular, younger students often employ phonological processing in reading development whereas older students later utilize RAN and word retrieval abilities in reading tasks (Meyer,

2000). These four factors are generally accepted as the fundamental influences affecting intervention before formal diagnosis takes place.

An estimated 50 percent of identified U.S. children have a learning disability (LD), indicating that LDs compose the largest subpopulation of special education students (Büttner & Hasselhorn, 2011). A common screening procedure for students with LDs is the "aptitude-achievement discrepancy," which represents the cross-analysis of an individual's intelligence (measured by IQ) and performance in reading, writing, and mathematics (Büttner & Hasselhorn, 2011). The discrepancy assessment is often composed of intelligence testing and achievement testing in specified content areas. The assessment leads to diagnosis if independent scores meet a predetermined requirement in deviation (Büttner & Hasselhorn, 2011). This approach has been used since the introduction of federally mandated education services to students with LDs in 1968 (Meyer, 2000). The rigidity of the evaluation and the specific deviation requirement has led to major opposition to the "aptitude-achievement discrepancy" measure. These assessment characteristics can cause struggling students to "fall through the cracks" by not meeting the necessary quantifications (Büttner & Hasselhorn, 2011). Additionally, ambiguous criteria and unclear guidelines (including the lack of one national discrepancy score) lead to variation from state to state. Residence in certain states or relocation can mean that some students do not receive adequate support for their educational needs (Meyer, 2000).

Prior to 2004, the aptitude-achievement discrepancy assessment was a federally mandated component necessary for identifying students with SLDs (Bradley, Danielson, & Doolittle, 2007). In the 2004 reauthorization of the Individuals with Disabilities Education Act (IDEA), which is one of many educational provisions for students with disabilities, the discrepancy requirement was repealed. This allowed for alternative modes of identification to be used; another

method is "Response to Intervention" (RtI) (Bradley, Danielson, & Doolittle, 2007). RtI effectively measures individual response to "scientific, research-based intervention" as a means to evaluate and identify SLD learners (Bradley, Danielson, & Doolittle, 2007, p. 9). Several states have begun investigating RtI as an identification tool (Bradley, Danielson, & Doolittle, 2007).

RtI involves two prominent approaches: the "problem-solving approach" and the "standard-protocol approach" (Büttner & Hasselhorn, 2011). The former bases intervention methods and goals on individual student analysis and specified difficulties; the latter applies research- and evidence-based intervention practices to individuals or small groups (Büttner & Hasselhorn, 2011). Consequently, RtI is growing in popularity for the same reasons that popularity of the "aptitude-achievement approach" is declining.

Intervention and treatment among diagnosed students vary in task content, length of time, and focus areas, along with other factors. Generally, the treatment phase is determined by a neurologic evaluation and assessment of motors skills, testing focused on phonologic skills, and a speech-language component (Kipp & Mohr, 2008). Attention spans, working memory and other factors associated with dyslexia may also become part of the treatment (Kipp & Mohr, 2008). Both children and adults with dyslexia experience deficits in several cognitive processes that are intricately tied to reading development. Because none of these deficits are caused by relative intelligence or individual IQ score, deficits can be mitigated with proper instruction. Common among interventions is content that develops phonological processing skills. As noted, this development is especially important due to the role of phonological and morphological awareness in reading and writing comprehension (Odegard et al., 2008). While intervention is designed to impact students in positive ways, not all students benefit from intervention effectively. It is estimated that about two to six percent of children (though other estimates are higher (see Kipp &

Mohr, 2008)), do not respond to intervention (Odegard et al., 2008). Explanations for nonresponse depend on many factors; research by Odegard et al. using fMRI technology asserts the "pattern of brain activation associated with response to intervention" as influential (2008, p. 10).

Dyslexia in the Education System

Federal Provisions. Federally, there is legislation that mandates and promotes the service of individuals with disabilities within the school system. Notable laws include the Rehabilitation Act of 1973 (section 504), Americans with Disabilities Act (1990) or ADA, No Child Left Behind (2001) or NCLB, and the previously mentioned Individuals with Disabilities Education Act (2004) or IDEA. Section 504 of the Rehabilitation Act of 1973 prohibits discrimination of disabled individuals in the workplace but also extends protection to students "seeking equal educational opportunity" (Alexander & Alexander, 1984, p. 289). Similarly, ADA addresses the prohibition of discrimination and procurement of equal opportunity for individuals with disabilities (ADA, 2009). NCLB of 2001 was instrumental in ensuring that "all children have a fair, equal, and significant opportunity to obtain a high-quality education and reach, at a minimum, proficiency on challenging State academic achievement standards and state academic assessments" (Public Law 107-110, 2002, p. 1439). IDEA is said to be the "primary statute that governs the education of students with disabilities in public schools" established federally (Kaplan, 2010, p. 586). Although much is left open in the state implementation process, these laws have secured specific rights to students with disabilities in public education.

Standardized Student Performance. It is important to examine the state of the national public education system to understand dyslexia's presence in education. According to the 2013 Nation's Report Card**,** which measured almost 8,000 schools and over 190,000 students in both fourth and eighth grades, average reading scores have advanced by five points among fourth

grade students between 1992 and 2013, and eight points among eighth grade students between 1992 and 2013 (with a two-point advancement between 2011 and 2013) (2013, p. 4). More precisely, the trend in reading scores has remained stagnant among fourth grade students since 2009, with limited growth and periods of stagnation since 2000. For eighth grade students, average scores have been increasing steadily since 2007; before this increase, general stagnation and decline began in 1998 (2013, p. 5). The measures used to evaluate students include "basic," "proficient," and "advanced," with a score of "basic" indicating the ability to "locate relevant information, make simple inferences…and identify details that support a given conclusion" for fourth grade students; eighth grade students are expected to do the same, while including the ability to "state judgments and give some support about content and presentation of content" (2013, p. 6). In the fourth grade, "proficient" scores are determined by the student's ability to "integrate and interpret texts and apply understanding of the text to draw conclusions and make evaluations;" eighth grade students "should be able to provide relevant information and summarize main ideas and themes…make and support inferences about a text, connect parts of the text, and analyze text features…[and] fully substantiate judgments about the content and presentation of content" (2013, p. 6). Finally, while in fourth grade, "advanced" scores indicate that students "should be able to make complex inferences and construct and support their inferential understanding of the text…[and] apply their understanding of a text to make and support a judgment;" eighth grade students "should be able to make connections within and across texts and to explain causal relations…evaluate and justify the strength of supporting evidence and the quality of an author's presentation…[and] manage the processing demands of analysis and evaluation by stating, explaining, and justifying" (2013, p. 6). With these terms properly clarified, the results can be analyzed. In 2013, 32 percent of fourth grade students were "below basic," 33 percent were "basic,"

and 35 percent were “proficient” or “advanced” (27 and 8, respectively) (2013, p. 7). Eighth grade students were comprised of 22 percent of students scoring “below basic,” 42 percent “basic,” and 36 percent “proficient” or “advanced” (32 and 4) (2013, p. 7). These statistics show that many students, including typical learners, are not performing at or above the “proficient” level, which is regarded as average.

State Provisions for Students with Dyslexia. While state performance is relatively homogenous when controlling for geographic location, socioeconomic status, and various subcultural components, state expansion of dyslexia laws, proposed legislation, and pilot programs is more heterogeneous. Although “consistent and targeted early intervention” can aid students experiencing difficulty from cognitive deficiencies, several states lack explicit guidelines for the identification and accommodation of students with dyslexia (Youman & Mather, 2013, p. 133). Because broad understanding of dyslexia is lacking across school districts (many only recognize characteristics of dyslexia as “reading disabilities” or “Specific Learning Disabilities (SLD)”), intervention may be designed for SLD treatment and may not suit students with dyslexia (Youman & Mather, 2013).

Generally, there are four phases where states can enact (or neglect to enact) policies and programs for students with dyslexia: early screening, identification, intervention, and accommodation. First, early screening consists of pre-identification intervention (unlike later intervention methods) from staff or educators monitoring student performance. Because student reading progress is recorded in compliance with NCLB, early screening may vary in consistency (i.e., some states specifically screen for dyslexia while others provide generalized screening). The early screening process does not offer determinants for the student’s symptoms, leaving reading difficulty unidentified. Some states have or are in the process of expanding their school programs for

universal dyslexia screening, while others offer comprehensive educational services to parents and teachers. Second, the process of identification under IDEA (2004) mandates (1) an aptitude-achievement discrepancy formula, (2) failure of the student to respond to RtI measures, and (3) use of alternative measures in order to evaluate a student with a suspected SLD (IDEA, 2004). Generally, most states offer a K-2 screening. If difficulties persist, a formal dyslexia assessment is conducted for students in some states. In most states, however, a designated "school team" must determine whether a student meets the SLD criteria. Without this assessment, students may not receive specialized instruction or accommodations (Youman & Mather, 2013). Third, the intervention process usually begins after the commencement of formal identification. Although interventions aimed at reading difficulty attempt to develop phonological processing abilities, states that recognize dyslexia often offer more extensive provisions designed to curb difficulties among students. Many students are offered an Individualized Education Plan (IEP) or a 504 plan and utilize intervention methods accordingly. Additionally, some states offer customized educational services through multi-sensory instruction (MSI), which "combine auditory, visual, and tactile elements into learning tasks" (Youman & Mather, 2013, p. 142). Fourth, accommodations may be offered to students for testing and assignments depending on the state's level of dyslexia recognition. These accommodations might include oral reading of questions, extended time for assessments and/or other accommodations for spelling and reading assignments. Implementation of student accommodations is interpreted and conducted by the classroom teacher in accordance with the IEP (or 504 plan). Other states may offer "bundled accommodations," which include exceptions for state-assessed testing (Youman & Mather, 2013).

Overall, some states fare better than others in identifying, intervening, and accommodating students with dyslexia. Specifically, California and Texas have passed extensive legislative

provisions for dyslexia programs in schools, the independent recognition of dyslexia as a disability, and teacher training. States that currently have pilot programs include Louisiana, Mississippi, Ohio, Oklahoma, Virginia, and Washington. States with pilot programs pending implementation (as of 2013) include Illinois, Kansas, and West Virginia. Most states have some provision for students within the four phases of state involvement (as previously mentioned). Only few have no provisions (Youman & Mather, 2013).

Teacher Knowledge of Language and Proper Instruction

Questions of teacher preparedness in servicing students with disabilities—specifically those with dyslexia—have increased in importance among both researchers and educators. With performance stakes placed higher to provide all students with the most comprehensive instruction, it is posited that pre-service teacher training programs (e.g., higher education institutions with education programs) are inadequate for addressing demands placed on general classroom teachers (Mather, Bos, & Babur, 2001). Furthermore, classroom inclusion now mandates that general education classroom teachers are handling the instruction of students receiving accommodation (although intervention and treatment typically happen outside of the general classroom). Because accommodated students are increasingly remaining in the classroom, researchers argue that it is not only enough that an educator "to be literate alone but rather, that teachers need an explicit understanding of the constructs related to the English language" (i.e., morphemes, phonemes, etc.) (Washburn et al., 2011, p. 23). Washburn et al. also argue that both teachers and pre-service teachers are not receiving adequate training and do not hold sufficient knowledge for properly instructing students with disabilities (2011). After measuring pre-service teachers' knowledge of various language components, Washburn et al. found that respondents had limited

knowledge of these components. Results lent to the conclusion that many pre-service teachers are not adequately prepared to teach struggling readers (Washburn et al., 2011).

A later study conducted by Binks-Cantrell et al. also found that among current classroom teachers, knowledge of basic language constructs was limited (2012). In a survey design similar to the work of Washburn et al., teacher knowledge was measured based on the "five fundamental language constructs"—phonological awareness, phonemic awareness, alphabetic principles, phonics, and morphology (Binks-Cantrell et al., 2012). Results indicate that teachers held limited knowledge of these components, while over-estimating their relative skill (the ability to perform tasks involving these components). Based on Binks-Cantrell et al.'s and other studies measuring teacher training and classroom performance in educating students with disabilities, means of improvement could be beneficial for both students and teachers (2012). If improvements are to be accomplished, program reform must begin at the higher-education level and throughout the training process for pre-service teachers. For current teachers, professional development opportunities should be utilized as a remedial effort to improve knowledge of the structure of language and proper instructional approaches.

The Role of the Study

Although there is much available research about the evolution, characteristics, diagnosis and intervention process, laws and policies, and teacher knowledge surrounding dyslexia, much remains unanswered. Research presented herein hopes to contribute to current testing practices of students with dyslexia and, generally, to offer more information about an increasingly common disability. In preceding sections, thorough explanation of the research questions and methodology employed throughout the study will be offered. Results and analysis of the research will also be shared, along with discussion of the findings and concluding statements.

Research Questions

The cruciality of testing is a relevant aspect of current education practices. Due to existing information about students with dyslexia (i.e., deficits in phonological processing, RAN deficits, and their need for multi-sensory-based and explicit structure-of-language instructional practices), it is important to develop proper curriculum and testing procedures. Common among timed tests is the 60-second, or "60-sec," timing. Used in many capacities, this measure is designed to test student output of knowledge in a concise time frame. Often, students with dyslexia are given accommodations (according to pre-specified guidelines, as noted in preceding sections) that allow for additional test time. Although added time may seem effective intuitively, known deficits in RAN may mean that increased time in testing could be more harmful to students with dyslexia. With typical learners, the rapid and sequential naming of content (such as colors, numbers, letters, etc.) increases over time. The opposite is true for student with dyslexia; RAN deficits among dyslexic learners can cause decreases in rapidity and stamina over time. Consequently, accommodations that offer increased time may yield less improvement in achievement for students with RAN deficits. For this reason, two research questions are posed; the first examines the role of the Graphic Organizer (GO) an as instructional tool, while the second examines differences within the first and second 30-second intervals of a 60-sec timing. The first research question investigates whether the use of the graphic organizer during intervention improves morpheme output. The second research question examines whether students with dyslexia and characteristics of dyslexia perform at increased output levels during the first 30 seconds of 60-sec timings.

Chapter 2: Method

Participant

The study was conducted using a single-subject A-B research design. The participant is a 23-year-old female university student (ranked as a junior) attending a regional campus of a large, public university. Though the participant has never been formally diagnosed with dyslexia, both parents are dyslexic and she displays characteristics of dyslexia. The participant did not have an IEP throughout primary and secondary education; however, she has received specialized tutoring prior to entering higher education. Currently, the participant receives accommodation for exams through the university's Office for Disability Services. Accommodations include extended test time, a quiet room, and a reader/scribe when appropriate. The participant's chosen subject of study is business; she is an average-performing student across all coursework. In order to take part in the research, the participant signed a release form granting permission to publish relevant data while maintaining full confidentiality. The subject received compensation at a rate of $10 per session for her participation in the study.

Setting

Each session was conducted in a private campus office. Pre-Baseline sessions (the first phase) lasted approximately 60 minutes while Baseline sessions (the second phase) lasted an average of 17 minutes. Once Intervention (the third phase) commenced, sessions were conducted over an average of 67 minutes. The three phases of the study were conducted over a total of eight weeks. Five weeks of the study contained two sessions per week, while three weeks contained one session per week. The number of sessions per week never exceeded two. Beginning with the second Intervention session, all previously taught morphemes were reviewed silently by the subject prior to the instruction of the five new morphemes. No review of morphemes took place out-

side of the sessions to reduce possible confounding variables. To the researcher's knowledge, the participant had not received any previous morphemic instruction but had used a technique similar to the GO and the self-graph with a former tutor.

Procedures

The two research questions are studied by use of morphemic instruction and repeated timings of learned morphemes. The study was conducted in three distinct phases: Pre-Baseline, Baseline, and Intervention phase. Within these phases, the design varied slightly. Overall, the study design was implemented by using a set of predetermined morphemes, specifically involving various prefixes, suffixes, and lower level Latin root words developed and copyrighted by Ron Yoshimoto.

Pre-Baseline. The purpose of Pre-Baseline was two-fold: first, Pre-Baseline helped to ensure internal validity and to remove a major confounding variable of the study (i.e., prior participant knowledge of morphemes later taught in the Intervention phase). Second, Pre-Baseline aided the researcher in determining which morphemes to introduce throughout Intervention (based on which morphemes were unknown to the participant). Pre-Baseline phase was conducted over two sessions wherein the participant was shown 277 morphemes. Since no previous instruction of these morphemes was given, specified levels of output were unnecessary. After all unknown morphemes were determined, 33 unknown morphemes were randomly chosen to create a flashcard deck. All morphemes in the deck were duplicated, which formed a 66-card deck. Duplication of morphemes within the deck was necessary to avoid creating a "ceiling" for morpheme output during the 60-sec timings.

Baseline. After Pre-Baseline established unknown morphemes, Baseline phase commenced. Baseline phase took place over five sessions and involved the subject silently reading

the morphemes from the deck and either offering the morpheme's definition or skipping the morpheme by saying "pass" during the 60-sec timings. Two 60-sec timings were conducted per session. These timings helped to validate that the morphemes were truly unknown to the subject. Throughout the timings, the participant held the card deck. As the participant progressed through the deck, each morpheme card was flipped morpheme-side down toward the researcher. The researcher was responsible for silently reading the definition and assigning each card to the designated pile ("correct," "pass," and "incorrect") based on the participant's response. Stabilization of morpheme output by the participant also served to test the effectiveness of the graphic organizer and later timings in the Intervention phase. Unfortunately, the baseline phase was inadvertently extended, due to statistical oversight errors and confusion in the stabilization process.

Intervention. After the data stabilized in Baseline, the Intervention phase began. Each Intervention session included the instruction of five different morphemes by use of the graphic organizer and card deck, review of previously taught morphemes (starting with the second session), one 60-sec timing, and the participant's self-graphing of morpheme identification progression. Prior to each session, the researcher would shuffle the morpheme deck numerous times and randomly choose five morphemes (if previously taught morphemes are randomly chosen, they are placed back into the deck and a different morpheme is chosen). The researcher then chose two example words that contain the morpheme (words taken from the line provided on the morpheme cards) and used standard dictionary definitions.

Throughout the study, a total of six Intervention sessions were conducted. Each intervention session lasted between 45 and 67 minutes and began by reviewing previous morphemes. After all previously taught morphemes were reviewed, the participant was introduced to five morphemes singularly. Using the graphic organizer (see Figure 1), the participant was taught the

morpheme (the researcher read the morpheme aloud and also provided the morpheme card for visual reference) and was asked to write the morpheme in the center circle while simultaneously saying it aloud. This component of Intervention offered multi-sensory instruction by stimulating auditory and visual senses. In the upper-left corner of the graphic organizer, the participant was given the morpheme's definition. In the upper-right corner, the two predetermined example words containing the morpheme and their definitions were written and underlined by the participant. At the bottom of the graphic organizer, the researcher offered a sentence containing one of the example words to provide contextualized meaning of the morpheme. For depiction of the graphic organizer, see Figure 1. Once the graphic organizer was completed, the participant repeated the morpheme, its definition, and one of the example words. The participant then turned the graphic organizer facedown and the researcher showed the morpheme card to the participant. The participant named the morpheme, stated its definition, and provided an example word. After the instruction of three morphemes was completed, each was reviewed before introducing the last two morphemes. After all five morphemes were introduced and reviewed, the morphemes were placed into the deck, the deck was shuffled (several times to ensure randomization), and the 60-sec timing was completed using the 66-card deck. As in Baseline, the participant would hold the deck and name as many morphemes as possible in one minute. The participant would flip the card morpheme-side down, and the researcher would check for the correct definition. In the Intervention phase, the cards were also separated into three categories (i.e., "correct," "pass," and "incorrect'"), according to participant responses. To compare the participant's output performance in the first 30-sec and the second 30-sec, the researcher further separated the three categories into "first 30-sec" and "second 30-sec" piles. After one timing was completed per session, the participant self-graphed the total correct and incorrect responses and the total number of

cards. The total number of correct morphemes was graphically represented using a dot "•," and an "x" represented the total number of incorrect morphemes. The total number of cards was depicted by the capital "T" symbol. The participant then connected the new data point with existing points and could self-monitor progress. Refer to Figure 2 for depiction of the self-graph.

Figure 1: *Graphic Organizer*

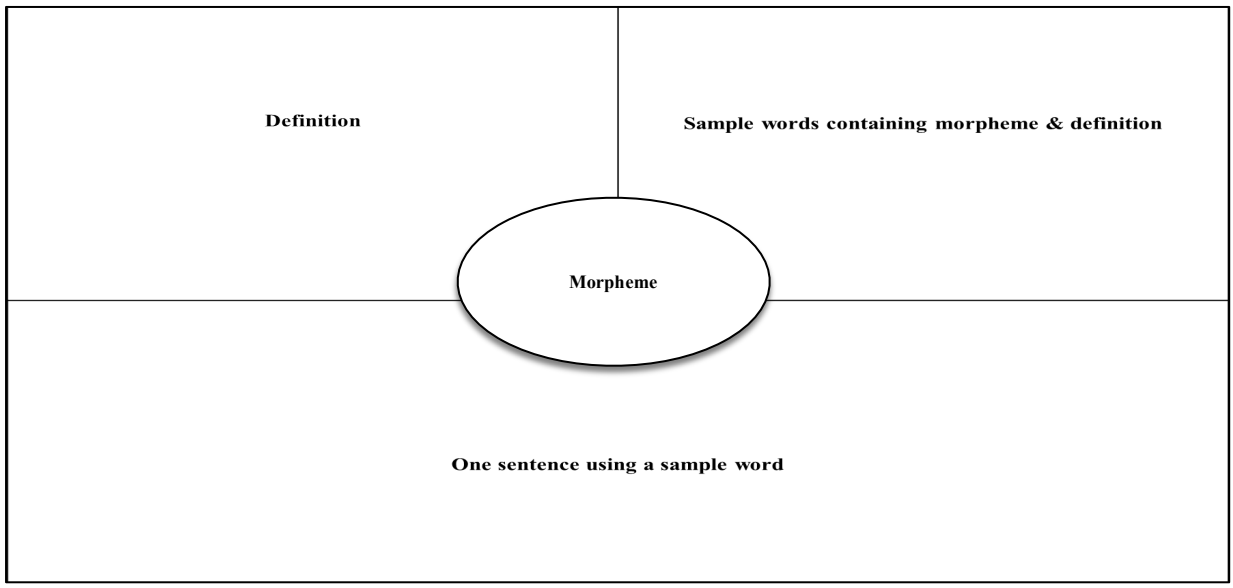
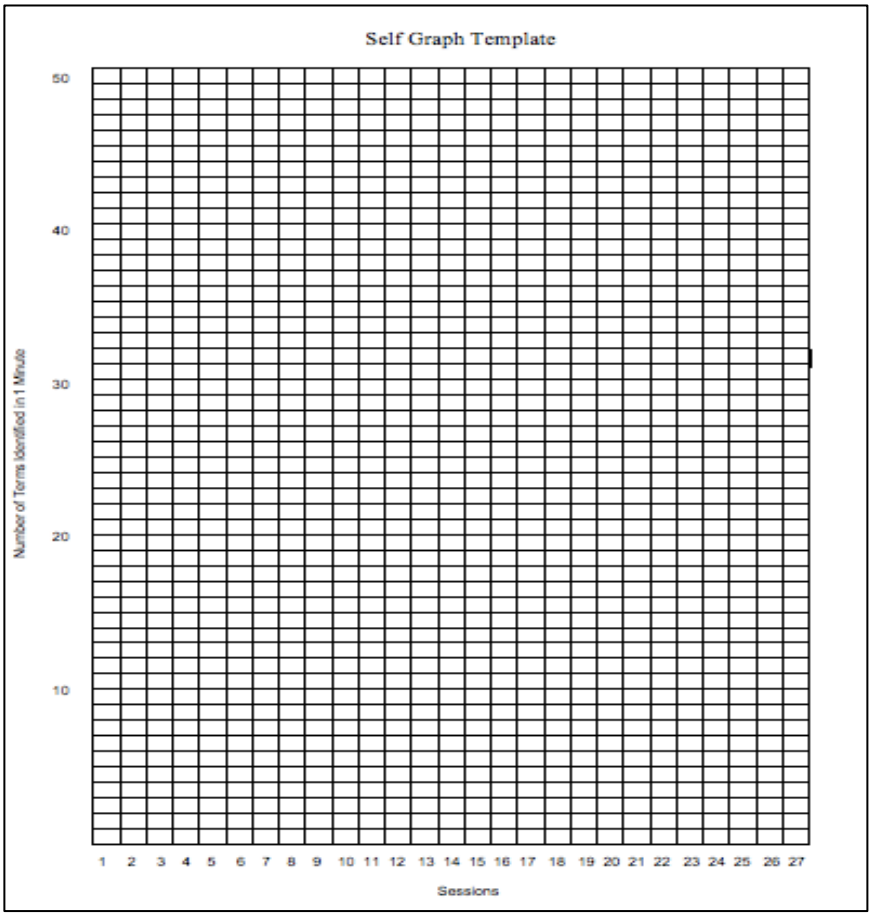


Figure 2: *Template of Self-Graph*



Chapter 3: Results

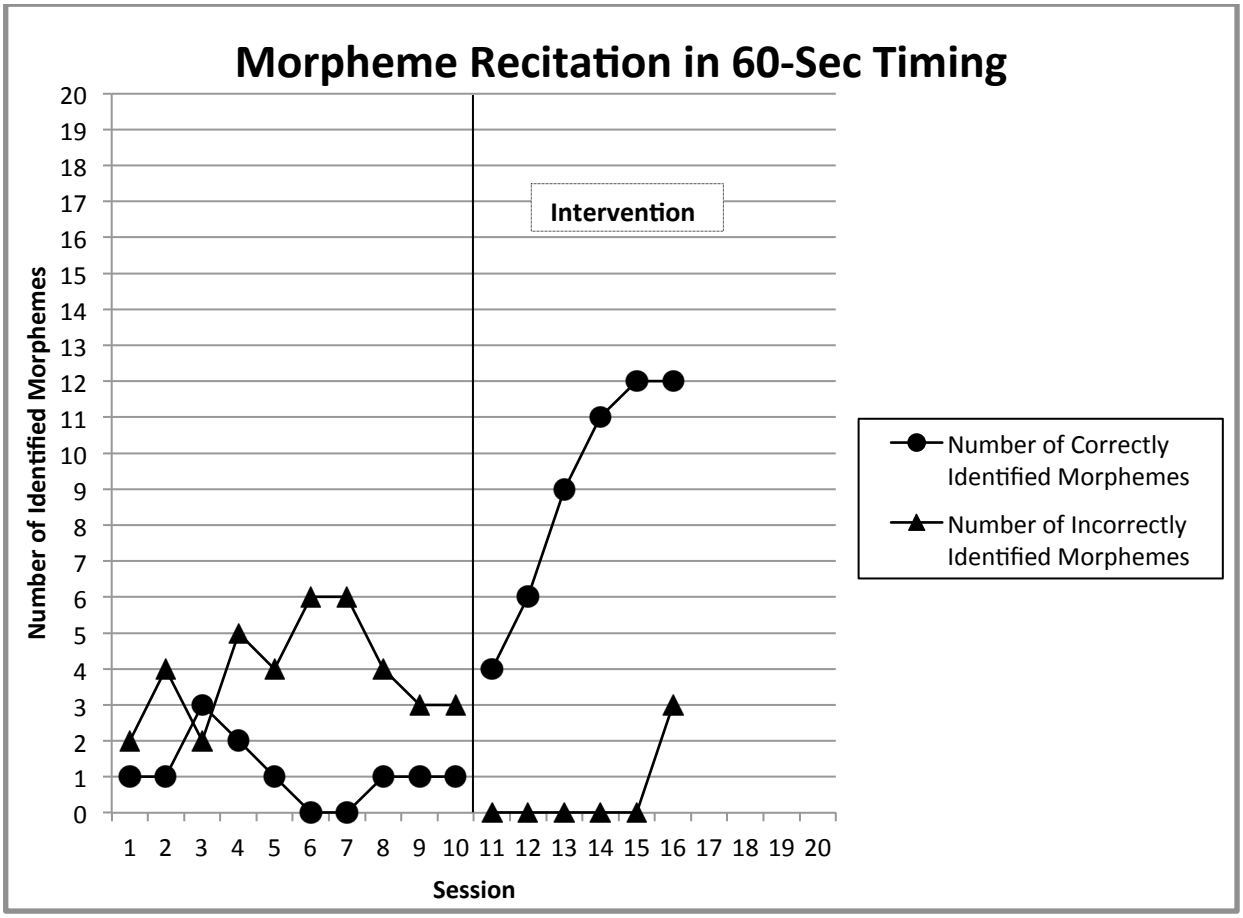
Beginning with Baseline, the participant correctly defined an average of 1.1 morphemes and incorrectly defined an average of 3.9 morphemes. Total morpheme responses (including "correct," "incorrect," and "pass") across all five Baseline sessions (including two 60-sec timings per session) averaged 19.9, with a maximum of 29, minimum of 15, and median of 18.5. Before moving to Intervention phase, morpheme responses within the timings were required to stabilize for purposes of validity. Stabilization is represented by the stagnation or decline in correctly identified morphemes across three timings. In this sense, Baseline data stabilized after the third session. As mentioned, the Baseline phase was inadvertently extended to include a fourth

and fifth session. Although unnecessary, the two additional Baseline sessions do not taint subsequent results shown throughout Intervention.

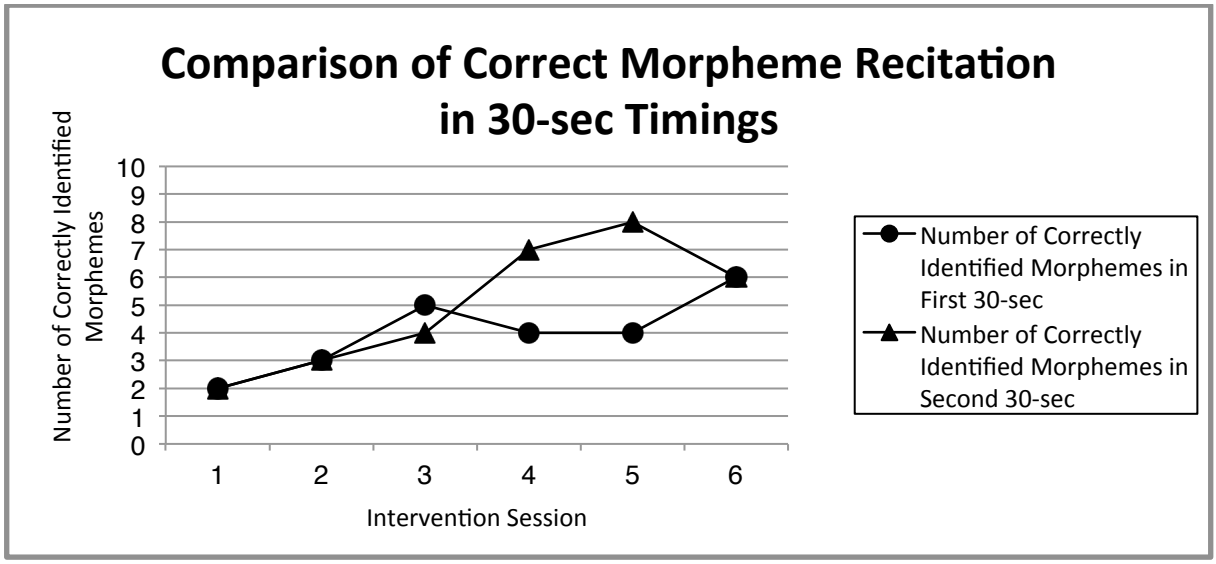
Following the fifth Baseline session (or the tenth 60-sec timing), the participant began the Intervention phase. Distinct from Baseline, this final phase included multi-sensory instruction of five morphemes per session with the use of the graphic organizer, review of previously taught morphemes (when applicable), and only one 60-sec timing. Participant self-graphing of timing results took place in both Baseline and Intervention phases. Across the six 60-sec timings within Intervention, the average number of correctly defined morphemes was nine; conversely, the average number of incorrectly defined morphemes was 0.5 (this figure was zero across sessions six through ten). Total responses averaged 39.3 morphemes per session, with a maximum of 45, minimum of 31, and a median of 41.5. Results depicting correct and incorrect morpheme response rates across Baseline and Intervention phases are depicted in Graph 1.

For the purpose of testing the second research question, morpheme responses (including "correct," "incorrect," and "pass") were divided into "first 30-sec" and "second 30-sec" segments throughout the timings. Within the "first 30-sec" measure, an average of 4 morphemes were correctly defined and an average of 0.17 morphemes were incorrectly defined across intervention timings. Alternatively, in the "second 30-sec" measure, an average of 5 morphemes were correctly defined, while an average of 0.33 morphemes were incorrectly defined. Correct morpheme responses compared across the first and second 30-sec in Intervention timings are shown in Graph 2.

Graph 1: *Correct and Incorrect Morpheme Responses Across Baselines and Intervention Phases*

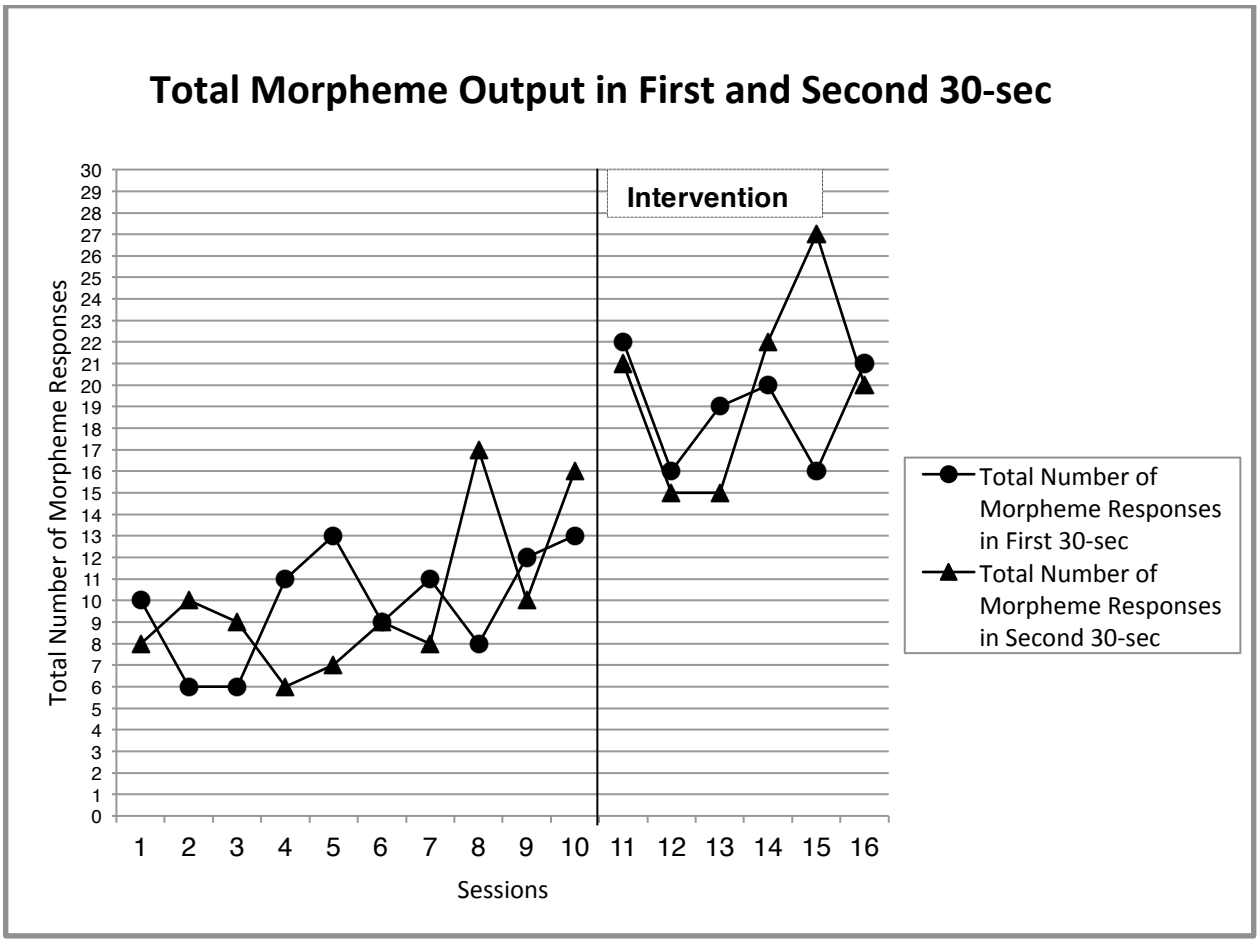


Graph 2: *Correct Morpheme Responses in First and Second 30-sec of 60-sec Timings*



Total morpheme output (including "correct," "incorrect," and "pass" responses) across both Baseline and Intervention phases was measured to examine the effect of morpheme instruction on response output. During the Baseline phase, an average of 9.9 morpheme responses were given by the participant within the first 30-sec, while an average of 10 morpheme responses were given in the second 30-sec of the 60-sec timings. Of the six timings conducted during the Intervention phase, the participant offered a total of 19 morpheme responses within the first 30-sec and an average of 20 morpheme responses in the second 30-sec. For total morpheme response output comparing the first and second 30-sec across both Baseline and Intervention, see Graph 3.

Graph 3: *Total Morpheme Output in First and Second 30-sec of 60-sec Timings*



Chapter 4: Discussion

The data indicate two important patterns for the research questions. First, multi-sensory and explicit instruction of specified morphemes during Intervention shows increases in both correct responses and total responses across the data. The data also indicate that as the participant began to learn and recognize morphemes taught throughout Intervention, the total number of responses increased. The number of correctly defined morphemes increased, while the number of incorrectly defined morphemes decreased (from 3.9 to 0.5) across phases. Furthermore, the overall number of "pass" responses also increased when moving from Baseline to Intervention. This suggests that the participant began to quickly distinguish familiar and unfamiliar morphemes. Using the process of morphemic recognition developed through graphic organizer instruction, perhaps the participant responded to taught morphemes with the correct definition (or "pass," if unable to recall) and reserved the "pass" response for all other unknown morphemes. Altogether, the *type* of instruction and techniques used (i.e., the graphic organizer, the timings, and the self-graphing) indicate the successful development and retention of taught morphemes. These results are supported by what researchers know to be best instructional practices and effective techniques for students with dyslexia and its characteristics.

The second important pattern detected in the data is the contrariness of the 30-sec timings to our second research question. Across Baseline, total morpheme output across the first and second 30-sec do not average equally but are similar (outputs of 9.9 and 10). Contrary to what is expected from students with RAN deficits, output in the second 30-sec is slightly larger than output from the first 30-sec. This indicates, among other possibilities, that the participant was, on average, *slightly* able to increase the speed of total morpheme responses over the course of the 60-sec timing in Baseline. A similar pattern is detected in the Intervention phase, where total

morpheme output averaged 19 in the first 30-sec and 20 in the second 30-sec. These averages across the six Intervention timings indicate, as in Baseline, that the participant had slightly faster morpheme output rates in the second 30-sec.

The results of this study indicate two primary conclusions. First, the dramatic increases of both correct and total morpheme responses when moving from Baseline to Intervention phase point to the effectiveness of the graphic organizer and the explicit, systematic instructional techniques. This affirms the first research question posed at the beginning of the study. While other methods of explicit instruction may also work in the same capacity or have yet to be tested, positive results from this study show the effectiveness of the graphic organizer, the timed tests, and the self-graph. Because research points toward the necessity of specialized instruction for students with dyslexia and with deficits in RAN and fluency (ADA, 2009; IDA, 2012), this study affirms the methods that educators can use to instruct students with specialized needs. The explicit, multi-sensory instruction produced by the graphic organizer is one such way to effectively teach content at the individual level. Self-graphing encouraged systematic goals and expectations for the participant. When Fishley et al. (2012) conducted research using the graphic organizer, timings, and the self-graph in a small-group setting it was similarly successful. There is no obvious reason why the graphic organizer instructional method could not be generalized to the classroom, due to success at the individual level and at the small-group level (Fishley et al., 2012). In the future, research should aim to test how the effectiveness of this instructional method fares in comparison to similar instructional methods. This method should also be applied to a larger group of students (i.e., a classroom-sized group) to test large group effectiveness and determine unpredicted caveats.

The results also suggest that in this particular study, the participant had a slightly lower average morpheme response rate in the first 30-sec than in the second 30-sec. The second research question asked whether students with dyslexia or characteristics of dyslexia would have higher output rates in the first 30-sec due to RAN deficits. From the results, it appears that in both Baseline and Intervention phases, the participant responded with higher average output rates in the second 30-sec, contrary to what is expected of individuals with RAN deficits. While there may be individual factors that encouraged these results from the participant (e.g., lack of diagnosis, lack of receiving specialized instruction in primary and secondary education, or lack of RAN deficits), this finding offers an ambiguous answer to the second research question. Because output averages between the first and second 30-sec were very similar, but slightly larger within the second 30-sec in both phases, the effect of Intervention cannot definitively be determined. Due to the limited numerical difference between averages, future research should continue to investigate this question. Additional research should expand the research design to use multiple participants with varying diagnoses, characteristics, and deficits. Studies should also try to conduct more timings and increase data collection to obtain a fuller understanding of timed-test performances by students with RAN deficits.

Conclusion

Students with dyslexia and its characteristics face many challenges within normative educational structures. These students often struggle with deficits in RAN and fluency when learning a variety of subjects. For these reasons, particularized instruction is deemed essential. More specifically, instruction utilizing an explicit and multi-sensory approach is best for students who struggle to connect morphemic and phonemic components. This study aimed to replicate and expand parts of Fishley et al.'s research (2012) by using the graphic organizer, timed tests, and

self-graphing. Prior to conducting research, two research questions were formulated. First, whether the use of the graphic organizer in morpheme instruction would increase correct morpheme responses within the timings. The second research question asked whether the first 30-sec segment would show higher rates of morpheme responses than the second 30-sec segment in 60-sec timings.

The prioritization of effective instructional methods for students with dyslexia and its characteristics is imperative. Administrators, educators, and parents face crossroads within the field of dyslexia. Either it must be accepted that growing populations of students with dyslexia are in need of specialized instruction and that services to students must be secured across all districts and states, or that the current status quo for recognitions and services will remain the same. Many stakeholders have primary roles in expanding educational opportunities and services for students with dyslexia. Researchers should continue to investigate best instructional practices for this student group. Administrators and educators should urge for conditions that allow students with dyslexia to receive the type of instruction necessary for their success. Pre-service teacher educators should work toward expanding their students' knowledge of dyslexia by developing proper training for teachers prior to entering the classroom. Parents and students should encourage administrations and school officials to provide materials that detail the characteristics of dyslexia, explicit steps toward acquiring services, and up-to-date information about current state legislation. However ambitious, the achievement of these goals by the aforementioned stakeholders will help to ensure proper educational practices and services are offered to the 20 percent of students who need them (IDA, 2012).

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